**REASONS for your Proofs gathered in one convenient location through Section 2.8**

**Reasons for Properties of Equality ONLY**

|  |  |  |
| --- | --- | --- |
| **Addition** | **If a = b, then a + c = b + c**  **If AB = XY and BC = YZ then AB + BC = XY + YZ**  **If = and =, =** | **You can add the same value to both sides! (it could be the exact same, or two different (segment, angles, variables) that are equal!** |
| **Subtraction** | **If a = b, then a - c = b - c**  **If AB = XY and BC = YZ then AB - BC = XY - YZ**  **If = and =, =** | **Exactly the same in nature as addition, but with a subtraction sign!** |
| **Multiplication** | **If a = b, then ac = bc**  **If x = y, then 12x = 12y** | **You can multiply the same value to both sides of an equation!** |
| **Division** | **If a = b, the a/c = b/c**  **If a = b and c = d, then a/c = b/d**  **If m = n, then m/3 = n/3** | **You can divide the same value into both sides of an equation!** |
| **Distributive** | **a(b+c) = ab + ac**  **w(x+y+z) = wx + wy + wz**  **5(3x+2y-6z) = 15x + 10y - 30z** | **If a value is in front of a set of parenthesis, you can “distribute” or multiply that value to EVERY term inside the parenthesis!** |
| **Segment Addition Postulate** | **If B is between A and C, then**  **AC = AB + BC** | **A whole segment will always equal the sum of its two parts!** |
| **Angle Addition Postulate** | **If D is in the interior of , then** | **An angle will always equal the sum of its two parts!** |

**Reasons that work for BOTH properties of Equality AND Congruence**

|  |  |  |
| --- | --- | --- |
| **Definition of Congruence** | **If , then AB = CD.**  **If , then** | **If the segments are congruent, then their measures are equal! (and vice versa!) Can be applied to angles as well!** |
| **Reflexive** | **a = a, AB = AB, , , ,** | **A value will always equal itself! On overlapping segments and angles when we need to add the same thing to both sides we use this reason first.** |
| **Symmetric** | **If a = b, then b = a**  **If =, then =**  **If , then** | **Basically, this is just for switching sides of an equation if necessary to make the “prove” statement look exactly the same.** |

|  |  |  |
| --- | --- | --- |
| **Transitive** | **If a = b and b = c, then a = c**  **If AB = BC and BC = CD, then**  **AB = CD**  **If and , then** | **Whenever you have a connecting piece that is congruent or equal to two other things, then those two things are congruent/equal to each other! If you are the same height as your friend Joe, and Joe is the same height as his friend Sue, then YOU and SUE are the same height! (Joe is the connecting piece)** |
| **Substitution** | **If a = b and b=2, then a = 2**  **If and , then**  **If AC = AB + BC and AB = BC, then AC = 2AB**  **If 2x – x = 5 + y + 2, then x = 7 + y** | **Substitution is used to replace like terms OR to combine like terms on one side of the equality.** |

**Reasons for Angle Proofs**

|  |  |  |
| --- | --- | --- |
| **Definition of Supplementary ’s** |  | **Supp. Angles add to 180** |
| **Definition of Complementary ’s** |  | **Comp. Angles add to 90** |
| **Supplement Theorem** |  | **If angles 1 and 2 form a linear pair in a picture, then 1 and 2 are supplementary!** |
| **Complement Theorem** |  | **If angles 1 and 2 are adjacent angles whose noncommon sides are perpendicular, then 1 and 2 are complementary!** |
| **Theorem 2.6** | **supplementary to are** | **If a set of angles is supplementary to the same angle or two congruent angles, then those angles must be congruent to each other!** |
| **Theorem 2.7** | **complementary to are** | **If a set of angles is complementary to the same angle or two congruent angles, then those angles must be congruent to each other!** |
| **Definition of Angle Bisector** | **If bisects , then** | **An angle bisector cuts an angle into two angles of equal measure** |
| **Angle Bisector Theorem** | **If bisects , then** | **An angle bisector cuts an angle into two congruent angles!** |
| **Angle Addition Postulate** | **If D is in the interior of , then** | **An angle will always equal the sum of its two parts!** |
|  |  |  |

**Reasons about Perpendicular Lines**

|  |  |  |
| --- | --- | --- |
| **2.9** Perpendicular lines intersect to form four right angles | **If and they intersect at point E, then are all right angles!** |  |
| **2.10** All right angles are congruent | **If are both right, then !** |  |
| **2.11** Perpendicular lines form congruent adjacent angles | **Of course they do!! They are all right angles!** |  |
| **2.12** If two angles are congruent and supplementary, then each angle is a right angle | **The only combination of two congruent, supplementary angles are 90 and 90.** | **90 + 90 = 180** |
| **2.13** If two congruent angles form a linear pair, then they are right angles | **Linear pairs are supplementary. So if both angles are congruent as well, they have to be 90 each!** | **X + Y = 180**  **2X = 180**  **X = 90** |

**Some Basic Point, Line, Plane Postulates**

|  |  |  |
| --- | --- | --- |
| **2.1 Through any two points, there is exactly one line** | **AB = BA** | **Used to switch order of points on a line** |
| **2.2 Through any three points not on the same line, there is exactly one plane.** | **Any 3 noncollinear points define a plane!** |  |
| **2.3 A line contains at least two points.** |  | **Used for adding points onto a line if necessary** |
| **2.4 A plane contains at least three points not on the same line.** |  | **Used for adding points onto a plane if necessary** |
| **2.5 If two points lie in a plane, then the entire line containing those points lies in that plane.** | **If is on plane P, then points H, I, and J are on plane P as well!** |  |
| **2.6 If two lines intersect, then their intersection is exactly one point.** | **If intersects then they MUST intersect at point B.** |  |
| **2.7 If two planes intersect, then their intersection is a line.** | **ALWAYS list a LINE as an intersection of two planes!** |  |